

9th ICSA

International Council for Sustainable
Agriculture (for Food, Energy and
Industry)



Book of abstracts

International Conference on

RELIABLE RENEWABLE ENERGIES FOR OFF-GRID EMPOWERING RURAL HABITATS

25-29 August 2019, Nordic Folkecenter for Renewable Energy,
Hurup Thy, Denmark



Nordic Folkecenter
for Renewable Energy,
Denmark



Danish Test and Resource
Centre For Small Wind
Turbines, Denmark



International Center for
Renewable Energy,
Germany



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Germany



Food and
Agricultural Organization,
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Introduction

This conference promoted the efficient usage of natural resources for production of renewable energy by rural agricultural communities in order to ensure food safety and security; it also promoted the usage of sustainable energy for various farm activities as well as to conserve water resources and environment.

The theme of the conference was carefully selected to serve the interests of governments, private sector and the public as a whole.

It was great to hold the conference again at Nordic Folkecenter for Renewable Energy, institution which shows strong commitment and active leadership in promoting innovation on sustainable energy.

The conference was an occasion for local and international researchers to share knowledge and exchange experiences.

In the past, the conference was held eight times: two times in Germany and one time each in Denmark, China, Canada, Japan, Malaysia and Iran.

**The presentations of the event can be found [here](http://Folkecenterevents.net)
(Folkecenterevents.net - Previous events - 9th ICSA Conference)**





The Conference

Conference Topics

The papers presented during the conference were divided into seven topics:

1. Energy, Food and Water Security and policy
2. Green Renewable Energy Systems
3. Use of Small Wind Turbines for Agricultural Applications
4. Energy, Environment in Industry and Environmental Impact
5. Sustainable and Eco-friendly Agriculture
6. Smart Farming Technology
7. Value Added Zero Waste Processing Technology

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Prof. Aliriza Noorpoor (Iran)



The Conference

Session 1: Energy, Food & Water Security and Policy

Investigation of Flow Distribution along Multi Outlet PVC Pipe

Yousef Almolhem, King Faisal University, Saudi Arabia

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Storage Practices for Nutricious and Healthy Food

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Water Resources Management in Iraq: An Overview

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The Past, Present and Uncertain Future of Community Energy in Denmark: Critically Reviewing and Conceptualizing Citizen Ownership

Leire Gorroño Albizu, Aalborg University, Denmark

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Session 1

Investigation of Flow Distribution along Multi Outlet PVC Pipe Based on Physical Model

Yousef A. Almolhem (1)*, Thamer Ahmad Mohammad (2)

Multiple outlets pipe is technically called manifold and it can be used in water distribution and collection systems particularly in agricultural irrigation systems. For water transported along the manifold, there are variations in discharge from the pipe outlets due to friction head losses. A test rig is designed and fabricated for testing the variation of discharge from multiple outlets dead end PVC pipe. The rig consists of a water supply tank, various diameters multiple outlet PVC pipes with a constant spacing of 1.5 m, and piezometers. The variation of discharge along the multiple outlets PVC dead end pipe is studied under different hydraulic conditions. In this study, results showed that the variation in discharge along the pipe is mainly due to change in piezometric head along the pipe outlets. The change in head along the dead end multi outlet pipe is mainly due to the accumulated friction losses. Besides, it is found that the spacing between outlets and the diameters ratio, DR (ratio between outlet diameter, do to the main pipe diameter, d) are factors that affect head loss along the multiple outlet PVC pipe.

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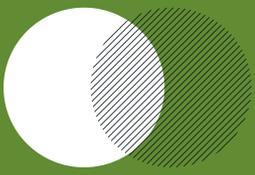
The change in Reynolds number along the multiple outlets PVC can be attributed to the decreasing flow. Thus, the coefficient of friction is varied accordingly. A better uniformity, (last outlet discharge, q_n /first outlet discharge, q_1) is obtained with bigger S/d ratio (ratio of spacing between outlets, S to manifold diameter, d). For simplicity, many literatures assumed that the coefficient of friction along multiple outlet pipes is constant. In fact, the results of this study showed that this assumption is not accurate.

Keywords: PVC pipe, multi outlets, spacing, head loss, uniformity, investigation, physical modelling

Yousef Abdulaziz Al-Molhem

Dr. Yousef Abdulaziz Al-Molhem is an associate Professor at the Department of Environment and Natural Resources, College of Agriculture and Food Sciences, King Faisal University, Al-Hasa, Kingdom of Saudi Arabia. In 2009, he was awarded a Ph.D. Degree in Biological and Agricultural Engineering from Faculty of Engineering, University Putra Malaysia. He is active in research and he published many papers in local and international journals and conferences beside leading two research projects. Professionally, he did consultant works and has membership in Saudi Society of Agricultural Sciences and Saudi Biological Society.





Session 1

Storages Practices for Nutricious and Healthy Food

Seema Sonkar, Chandra Shekhar Azad University of Agriculture and Technology, India

The major food crops such as cereals grain and some fruits and vegetables are generally seasonal crops, but whole grain or other food items are not consumed immediately after production. In order to ensure the uniform consumption around the year prompted the need for storage of produced grain. Grain generally stored by the farmer or housewife to meet their own consumption, facing emergency need and seed for the next sowing season. When temperatures are not properly controlled, food can spoil. For example, for every 180F rise in temperature within the moderate temperature range where most food is handled (500F to 1000F), the rate of chemical reaction is approximately doubled. As a result, excessive heat will increase the rate of natural food enzyme reactions and the reactions of other food constituents. As a result, protein will breakdown or denature, emulsion will break, some vitamins will be destroyed, moisture will be lost and foods will dry out, and the colour, flavour and odour of same products may be affected. The average moisture levels of fresh wheat were 10.97% and wheat from home storage was 9.04%. Ash content was found to be high in fresh wheat (1.53%) than wheat from home storage (1.00%). The average protein content of fresh wheat was found to be 13.24% whereas wheat from home storage was 11.46%. study was carried out to



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analyze the effect of food storage practices (cold storage, farm storage & home storage) on sensory and nutritional quality of food items. The study indicates that during storage maximum respondents were use insecticides as fumigant to protect the food items. Maximum 62.00 percent respondents of home storage, 58.00 percent respondent of farm storage and 52.00 percent respondents of cold storage don't know that the taste and flavour of food items were affected after storage.

Keywords: Food storages, nutrients, farm storage, cold storage

Seema Sonkar

Dr. Seema Sonkar was born at Kanpur city, She completed their 10 from MKG college Kanpur in 11+2 from M.G.Civil lines kanpur, and Undergraduate degree Bsc from CSAU



university in 1996, M.Sc. Food Science degree in 1998 from the same University Kanpur, and qualified the NET and ARS in 1998 then join as a lecturer in Kanpur Vidya Mandir Degree College, Kanpur college from 1998 to 2000 after that joining as an Assisstant Professor in 2001 in the Food Science & Nutritional Department of of C.S. Azad University Kanpur, area of specilisation in teaching Food nutrition, clinical nutrition, food processing, dietetic food, micronutrients, therapeutic nutrition, community nutrition, she guided Msc student thesis more than 35 as a major



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guide and more than 40 students of Msc as a co guide, Five student of phd as co guide, the research work emphasis on therapeutic nutrition, clinical nutrition and micronutrient fortified products. She attended ten national five international conference in india and presented paper in international conference at malaysia, and Gottingen, poland, Berlin at Germany she published three books, four manuals. She has delivered the in different trainings programmes and also delivered the TV Talks and Live radio talks. One project Nutrifarm as a PI from 2013 to 2017. She has done other additional responsibilities as officer incharge of FSN department from 2007 to 2014, NSS Officer from 2001 to 2004 and hostel warden from 2001 till now. Two project from state govt. of India. She recieved award in excellence in teacing award and young scientist award, Research work Award.



Session 1

Water Resources Management in Iraq: an Overview

Thamer Ahmad Mohammad, University of Baghdad, Iraq

The main sources of water in Iraq are rainfall and snowfall at the catchments of rivers Tigris and Euphrates. The availability water resources are highly affected by the operating policy of dams and reservoirs built upstream on common rivers in countries such as in Turkey, Syria and Iran. Almost, 70% of the water discharges in rivers Tigris and Euphrates are flowing from outside Iraq. Up to date, there is no international agreement between Iraq and the neighbouring countries that state how to share the water resources at common river basins. In addition, the neighbouring countries started to develop common river basins of Tigris and Euphrates and these developments are negatively affected the water resources in Iraq in term of quantity and quality. If the neighbouring countries continue to their development in the common river basin, it will affect the sustainable management of the water resources, decrease irrigated land, increase desertification and increase dust storms.

Thamer Ahmed Mohammed

Currently, Professor Dr. Thamer Ahmed Mohammed attached to the College of Engineering, University of Baghdad since March 2017. He is specialized in Water Resources





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Engineering. He served as a professor, associate Professor and senior lecturer at the Faculty of Engineering, Universiti Putra Malaysia from January 1995 to February 2017. He has memberships in ASCE, Groundwater Association California, and European Desalination Society, Malaysian Society for Engineering and Technology and Iraqi Engineers Union. Throughout his service he published more than 150 journal papers, 100 conference papers, one book, two chapters in books besides supervising many Ph.D. and M.Sc. students. He obtained many medals in the international exhibitions and has one granted patent. As an engineer, He involved in the design of many projects in Malaysia and Iraq.



Session 1

The Past, Present and Uncertain Future of Community Energy in Denmark: Critically Reviewing and Conceptualising Citizen Ownership

Leire Gorroño Albizu, Aalborg University

Important progress has been made in the understanding of citizen ownership. However, confusion persists about distinct characteristics of different models and particularly about the concept of community energy. Moreover, quantitative understanding of the contribution of citizen ownership to energy transitions is limited. This study advances the knowledge of citizen ownership by describing the empirical characteristics of citizen ownership of wind turbines and district heating systems in Denmark in the period of 1975-2016. The methods comprise statistical analysis, literature review and contact to experts in order to identify, quantify, describe and categorise Danish citizen ownership models. The results show the significant importance of citizen ownership to investment in and implementation of decentralised sustainable energy technologies. Modifications of institutional incentives have led to multiple and diverse citizen ownership models, whose main distinctive characteristics are related to geographical scope, type of profits and distribution of benefits. This observation is valid also for other countries, which makes the citizen ownership categories developed in this study



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relevant for international research on the topic.

Leire Gorroño Albizu

Leire Gorroño-Albizu holds a B. Eng. in Industrial Organisation and a M.Sc. in Sustainable Energy Planning and Management. Her PhD is part of ENSYSTRA, a European project funded by the Marie Curie grant programme. Her research focuses on ownership models for 100% renewable and smart energy systems.





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Session 2: Green Renewable Energy Systems

Off-Grid Renewable Energy Systems for Rural Communities in Egypt

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Sun Generator: Use Electricity When you Have it

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Rural Electrification in Mali

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Off-Grid Renewable Energy Systems for Rural Communities in Egypt

Galal Osman, College of Engineering, Mansoura University, Egypt

Off-grid renewable energy solutions represent a viable electrification solution that is rapidly scalable, environmentally sustainable, can be tailored to local conditions and, importantly, has the potential to empower rural communities, especially the youth and women. The next phase of expansion will require these solutions to play a fundamental role. It is estimated that by 2030, renewable energy sources will power over 60% of new electricity access, and stand-alone and mini-grid systems will provide the means for almost half of new access. Today we have the technologies and the solutions that can dramatically accelerate the growth trajectory of electricity access. Off-grid renewable energy solutions, including stand-alone systems and mini-grids, have emerged as a mainstream, cost-competitive option to expand access to electricity. The number of people benefiting from off-grid renewable energy solutions grew six-fold between 2011 and 2016, reaching more than 133 million. Besides providing electricity services for households, off-grid solutions are also increasingly supporting public services (e.g., education, water and primary health care) and livelihoods (e.g., in agriculture). The number of people living without electricity access has, after several decades of dedicated effort, dipped below one billion in



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2016. The world is steadily progressing towards universal access to electricity, with the global electrification rate reaching 87% in 2016. Access rates in rural areas – where most of those without access live – have been growing rapidly and now stand at about 76% (World Bank Group, 2018). Strong political commitment to the energy access agenda at the national and global level, combined with financing, local entrepreneurship and technological innovations, have set the stage for a final push towards universal electricity access by 2030 – a target within the Sustainable Development.

Galal Osman

Prof. Dr. Eng. Galal Osman has a MSc. in Engineering (1971) and a PhD in Engineering (1974) from the University of Cairo, Egypt. Throughout his career, he has been involved in many works related with renewable energy and education. Currently teaching at the College of Engineering, Mansoura University, he is internationally involved in promoting renewable energy, being the president of the Egypt Wind Association (since 1986) and the vice president of the World Wind Association (since 2002). Additionally, he has participated to all the World Wind Energy conferences and he is board member of different global renewable energy institutes.





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Sun Generator: Use Electricity When You Have It

Anker Mardal, Nordic Folkecenter for Renewable Energy, Denmark

PV panels are, by now, a very well known renewable energy technology. Their potential in rural areas is considerable, but it is often limited by the need of converting the DC current produced in AC, needed for most of the appliances. This requires an inverter, which is normally designed to operate either with batteries or when connected to a grid, factors which considerably limit its applications.

The Sun Generator's purpose is to substitute the inverter, therefore providing electricity to every part of the world where the sun shines. Although not capable of storing electricity, the Sun Generator aims at delivery electricity to those locations which still do not have access to it, electricity which can then be used for driving agricultural machinery or for other purposes.

More information about the Sun Generator can be found on <http://folkecenter.eu/pages/SunGenerator.php>.

Anker Mardal

Educated as an electro-mechanic, Anker Mardal has worked for most of his career in the electrical and electronical sectors. After a practical placement in Bang & Olufsen, a well know Danish company producing entertainment,





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he was involved in the development of short-wave radio devices, in Aalborg. Next, he designed electronic circuits for a company in Thisted and collaborated with the development of solar panels for Jysk Solenergi. Currently, he is collaborating with THYMøllen, a local company producing small windmills (6 and 10 kW) and he is responsible for the data collection system of the Danish Test and Resources Center for Small Wind Turbines, operated by Nordic Folkecenter.

Rural Electrification in Mali

Lise Nielson, Nordic Folkecenter for Renewable Energy, Denmark

Bringing electricity is bringing development, which is why more and more countries in Africa are trying to increase their electrification rate. In Mali, an important reality are micro-grids, which allow an easier establishment and operation. The electricity obtained by PV panels can then be used for agricultural purposes or for other applications.

Lise Nielson

Lise Nielson is an engineer with 25+ years of experience in grid integration of renewable energy technologies, and balance of system for small grid areas. User involvement and community ownership is her focus, because this is the best way forward in the green transition. Lise has a Masters degree in chemical



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engineering from The Danish Technical University 1993, and worked until 2009 in the planning department of the Danish transmission system operator Energinet. Since then she has operated her own consultancy business, but she also worked for a PV developer company, and is currently working at Nordic Folkecenter for Renewable Energy as an innovation consultant for small and medium businesses. She is halfway in her first term as an elected member of her local city council. Lise lives in Fredericia with her husband and their 5 children. Lise has extensive funding experience, both in creating a good project consortium and a sharp application for the national or EU level funding calls, and as an independent expert for evaluation of proposals.



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Session 3: Use of Small Wind Turbines for Agricultural Applications

Wind Turbines: from Amateur Machinery to Driving Industry

Tonny Brink, Nordic Folkecenter for Renewable Energy

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Scaling Wind Turbines: is it really Worth it?

*Anker Mardal, Nordic Folkecenter for Renewable Energy,
Denmark*

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Wind Turbines: from Amateur Machinery to Driving Industry

Tonny Brink, Nordic Folkecenter for Renewable Energy, Denmark

What once was considered "large wind turbines" are now labeled as "small". However, despite their limited capacity, these models from the past can still be used for many applications, among which agriculture. On the other hand, the "new small wind turbines" are getting more and more efficient and they have the potential to be coupled very well with agricultural applications. It is important, however, that both old and new models are reliable, which is why they should be tested by independent entities,

Tonny Brink

Educated as a Marine Engineer, he is Folkecenter's Chief Technical Director. He has got 35 years of experience in the international wind industry, working for Vestas Wind Systems A/S and Folkecenter. This has provided him with broad knowledge in service and maintenance site management and construction and operational project management. Hold positions and responsibilities (among others): Travel Technician, Site Manager, Logistics Coordination, Area Service Manager, Technical After Sales/Customer Reporting, Technology Transfer, Project Management and Execution Leader.





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Scaling Wind Turbines: is it Really Worth it?

Anker Mardal, Nordic Folkecenter for Renewable Energy, Denmark

When dealing with PV technology, installed capacity is not heavily affected by the price; the cost of the panels follows a linear curve, meaning that having 2 or 6 kW cost proportionally the same. This is not true for small wind turbines, where the difference in price can vary exponentially. What is then the optimal size and when should we stop looking at small wind turbines and consider other alternatives? Can this limit still cover the normal power needs of a conventional farm? And, most important: can the additional investment be paid back?

Anker Mardal

Educated as an electro-mechanic, Anker Mardal has worked for most of his career in the electrical and electronical sectors. After a practical placement in Bang & Olufsen, a well know Danish company producing entertainment,



he was involved in the development of short-wave radio devices, in Aalborg. Next, he designed electronic circuits for a company in Thisted and collaborated with the development of solar panels for Jysk Solenergi. Currently, he is collaborating with THYMøllen, a local company producing small windmills (6 and 10 kW) and he is



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responsible for the data collection system of the Danish Test and Resources Center for Small Wind Turbines, operated by Nordic Folkecenter.



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Session 4: Energy, Environment in Industry and Environmental Impact

Prevalence of Uranium in Ground Water of 54 Villages of Rohtak District of Haryana, India

Laura Jitender Singh, Maharshi Dayanand University, India

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Prevalence of Uranium in Ground Water of 54 Villages of Rohtak District of Haryana, India

Laura Jitender Singh, Maharshi Dayanand University, India

Groundwater naturally contains many chemicals compounds that are not tested on routine basis as indices of water quality despite their toxic effects. Uranium can prove lethal if present in higher level in ground water. Exposure to uranium occurs through direct ingestion of water and from agricultural products grown using groundwater containing uranium. Natural uranium induces more chemical toxicity, especially nephrotoxicity as compared to radiotoxicity at lower concentrations. Uranium is a naturally occurring radionuclide; the concentration in the groundwater depends primarily on the geochemistry of parent bedrock material of the aquifer. The mechanism of leaching of uranium from host rock to groundwater is a complex process. The concentration of uranium in groundwater depends on multiple parameters such as pH, EC, anionic legends, etc. Anthropological activities induced change in the groundwater quality and quantity due to pollution and overuse lead to shifting in uranium equilibrium concentrations in the aquifers. In the neighboring state of Punjab the electronic and print media is emphatically reporting that the uranium ingestion from ground water being a possible cause for multiple health hazards like cancer, increased



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defective birth rate or abnormalities among children (Autism), early graying of hair etc. According to recent reports there will be 1.73million new cases of cancer in 2020 in India. Haryana accounts for 39% of cancer death in India. Under National Uranium Project (NUP) coordinated by Health, Safety & Environment Group, Bhabha Atomic Research Centre (BARC), Mumbai, a study was carried out to establish the spatial distribution of uranium and associated water quality parameters in Rohtak district of Haryana. The study area was divided into grid size of 6 x 6 km running parallel to the latitude – longitude. At least one drinking water sample was collected from each grid. In this study 54 village groundwater samples were collected and analyzed for uranium and water quality parameters using BARC standard protocol. The mean TDS of the water samples was 1873 where as the mean uranium concentration was 53 ppb with range between 1.9 and 235 ppb. Nineteen samples out of 53 had uranium concentration higher than the 30 ppb WHO standard, while in 13 samples values were above the Indian Atomic Energy Regulatory Board (AERB) standard of 60 ppb. TDS, Mg²⁺, Cl⁻ and F quantities in the samples were higher than the Bureau of Indian Standards (BIS) for drinking water.



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Jitender Singh Laura

Professor Jitender Singh Laura is presently a professor in the department of Environmental Science at Maharishi Dayanand University, Rohtak, Haryana, India. He did his graduation in medical science and post graduation in botany from Kurukshetra University. Ph.D. in plant physiology on physiological effect of heavy metals in plants from CCS Haryana Agricultural University, Haryana, India. He joined as a Lecturer in Department of Biosciences, M.D. University and is teaching and popularizing science since 1992 to first generation learners from rural areas. His areas of interest include environmental management and conservation. Presently he is working on three projects sponsored by Board of Research in Nuclear Science, Department of Atomic Energy, Government of India on environmental monitoring of Uranium in ground waters of Haryana and Rajasthan States.





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Session 5: Sustainable and Eco-Friendly Agriculture

Energy Production Vis-à-vis Biomass Yield Evaluation of Different Fodder Crops/Grasses/Hybrids (with Confirmed Paternity using DNA Profiles) in Kharif Season in India

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Energy Radiation Use Efficiency in Wheat and Mustard Crops in North West Plain Zone, India

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Effect of Liquid Bioformulation (Plant Force Advance) on the Growth and Yield of BT Cotton Variety RS 2013 in Field Conditions

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Agroforestry in Africa for Sustainability and Climate Change Mitigation

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Energy Production Vis-à-vis Biomass Yield Evaluation of Different Fodder Crops/Grasses/Hybrids (with Confirmed Paternity using DNA Profiles) in Kharif Season in India

Yogesh Kumar Jindal, CCS Haryana Agricultural University, India

A number of fodder crops/grasses/hybrids (with confirmed paternity using DNA profiles) are grown during the kharif season for livestock across India as per the geographical location and agro-climatic conditions of the place. Five prominent annual fodder crops viz. C1- Sorghum (*Sorghum bicolor*), C2- Pearl millet (*Pennisetum americanum*), C3- maize (*Zea mays*), C4- Cowpea (*Vigna unguiculata*) and C5- Rice bean (*Vigna umbellata*) and eight perennial hybrids/grasses viz. C6- Bajra Napier Hybrid (*Pennisetum americanum* x *P. purpureum*), C7- *Pennisetum* Hybrid (*P. glaucum* x *P. squamulatum*), C8- *Cenchrus ciliaris*, C9- *Cenchrus setigerus*, C10- *Clitoria ternatea*, C11- Setaria Grass (*Setaria parviflora*), C12- *Desmanthus*, and C13- *Dichanthium annulatum* were evaluated in various trials conducted in 15-20 locations across the country. They were evaluated for green fodder yield and its attributes and bio-chemical parameters. Energy values were calculated from the observations. Comparative evaluation of the five annual fodder crops revealed highest green fodder yield of 487.4 q/ha in sorghum (C1) followed by pearl millet (C2) (414.0 q/ha) and maize (C3) (358.9 q/ha).



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Similar trend was observed for dry matter yield of 147.2, 162.4 and 76.4 q/ha, respectively. C1 gave a high production efficiency of 7.8 q/ha/day of green vs 3.9 q/ha/day of dry matter in comparison to C2 and C3. Other two crops viz. cowpea (C4) and rice bean (C5) being leguminous crops were having low yields but high crude protein of 15.1 and 13.6%, respectively in comparison to C1, C2 and C3 at 9.6, 8.7 and 8.1%, respectively. The in vitro dry matter digestibility (%) was highest for leguminous crops i.e. cowpea (C4) and rice bean (C5) (52.1 and 54.7%) as compared to C1, C2 and C3 at 44.7, 53.6 and 54.2%, respectively. Net energy for maintenance (NEm) was found highest in sorghum at 7.87 followed by pearl millet at 7.46 Mcal/lb. Similar trend was observed for NEg (net energy for growth); NEL (net energy for lactation) and TDN (total digestible nutrients). Perennial fodder hybrids/grasses were also compared and evaluated that revealed highest green fodder yield of 899.4 q/ha in Bajra Napier Hybrid (C6) followed by Setaria Grass (C11) 561.0 q/ha and Desmanthus (C12) 520.7 q/ha. . Dry matter yield of 210.5 was observed in C6 followed by C12 and C11 at 127.1 and 108.7 q/ha, respectively. C6 gave a high production efficiency of 11.2 q/ha/day of green vs 2.8 q/ha/day of dry matter in comparison to C12 and C10. Being leguminous crops in nature, Clitoria ternatea (C10) followed by Desmanthus (C12) gave high crude protein of 15.5 and 14.6%, respectively, whereas the rest of the perennial grasses/hybrids



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show a low of around 7% crude protein. Highest in vitro dry matter digestibility (%) was observed for C12 (58.8%) followed by Pennisetum Hybrid (C7) 55.0%, Dichanthium annulatum (C13) 53.3% and C10 44.6%. Net energy for maintenance was found highest in Clitoria ternatea at 7.44 followed by Cenchrus setigerus (C9) 7.22 Mcal/lb. Similar trend was observed for NEg (net energy for growth); NEL (net energy for lactation) and TDN (total digestible nutrients). Sorghum shows highest NEm whereas it has 4th highest green fodder yield is due to the low values of acid detergent fiber (ADF) is 35.6% as compared to highest green fodder yield of 899.4 q/ha in case of bajra napier hybrid whose ADF value is 45.7% and gave a low NEm of 6.83 Mcal/lb. The crops covered here in this study vary from high responsive crops to some crops grown in marginal lands and semi-arid areas, thus covering Haryana as well as whole of the country. Depending upon their performance for yield and its attributes, bio-chemical indicators and net energy values, these crops can be grown in different regions of India for maximizing quality fodder yield with higher economic benefits to the farmers – a step towards doubling the income of the farmers. This study reveals that it is feasible to select crop species for multiple uses for example energy, nutrition, biomass, dryness, high digestibility etc. Sorghum among cereals and cowpea covers all these functional uses.



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Keywords: Kharif, fodder crops, green fodder, dry matter, quality, net energy for maintenance

Yogesh Kumar Jindal

Yogesh Kumar Jindal, Ph.D. (Plant Breeding) currently working as Assistant Director (Research Extension Linkage) with Directorate of Research. Assisting the Director of Research about the scientific working of different



departments of the University. Earlier, he has worked as Assistant Scientist (Forage Crops) in the Department of Genetics & Plant Breeding at CCS Haryana Agricultural University, Hisar (Haryana) India for more than 24 years and has developed several varieties of Oats and sorghum.

Energy Radiation Use Efficiency in Wheat and Mustard Crops in North West Plain Zone, India

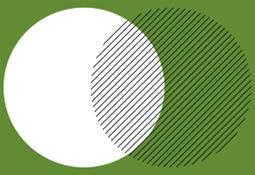
Rishi Behl, CCS Haryana Agricultural University, India

The process of photosynthesis determines the biomass yield of any crop by converting atmospheric carbon dioxide (CO₂) in presence of chlorophyll, sunlight and plant tissue water. The radiation received from sun is of wide spectrum and only certain wavelength constitute radiation use efficiency however, this can



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be diversify by changes in plastids, like chloroplast, and apoplast depending upon plant efficiency to absorb radiation and use it for photosynthesis. The empirical calculation has revealed that in wheat when only 0.25 PAR is used while there is no efficiency of water and nutrients the wheat yields could be raised to 17.7 tonnes/ha in India particularly in north west plain zone whereas the average yield of 3.1 tonne/ha. national average. The research work conducted at CCS HAU, Hisar, Haryana, India falling in NWPZ have revealed wild variation in Radiation use efficiency depending on the plant variety, date of sowing, plant nutrition etc. We conducted studies in wheat and mustard and obtained following results. Radiation use efficiency (RUE) is influence by different nitrogen doses in wheat, the lowest being in N1 (120 kg/ha.) and the highest being in N3 (180 kg/ha.) indicating almost linear relationship between nitrogen supply and biomass. RUE is also influence by the date of sowing of crop, physiological stage of plants and the number of days for accumulation of dry mass in early and late sown condition is different. Accordingly our result in case of wheat revealed that use of N3 (180 kg/ha.) dose of nitrogen under normal date of sowing (20th Nov.) will result in maximum radiation use efficiency, this also hold true for heat use efficiency. Similar results have been obtained in Mustard. It was observed that radiation use efficiency is influence by different varieties in mustard, the lowest being in Kranti and the highest



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being in the variety RH0749. The RUE is also influence by the date of sowing of crop and the physiological stage of plants and the number of days for accumulation of dry mass in early and late sown condition. Thus our results confirm in the case of mustard that selection of RH 0749 variety under normal date of sowing will result in maximum radiation use efficiency (RUE). This also hold true heat use efficiency (HUE).Therefore, to enhance crop production under climate change regime, selection of responsive crop varieties with judicious agronomic management for date of sowing, irrigation level and nutrient management etc. should be ensured.

Keywords: Wheat, Mustard, Nitrogen, Radiation Use Efficiency and Heat Use Efficiency

Plants Species from Different Agro-Ecologies and Forestry Systems for Bioenergy - an Overview

Rishi Behl, CCS Haryana Agricultural University, India

The fossil fuels based conventional energy sources like coal, gas and petroleum are fast depleting. More over these sources pollute environment. Under such situation fast growing plants grasses and tree species from different Agro-ecology and forestry system is source of biomass and hence sustainable energy. Sustainable and secure energy sources are essential for improving our living standards. At the same it is necessary to



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climate change by reducing our use of fossil fuels and increasing our reliance on renewable energy sources. Biomass currently accounts for about 10-20 per cent of global primary energy consumption and is playing an increasingly important role in the face of climate change, energy and food security concerns. Majority of biomass for bioenergy feedstocks comes from forests, agriculture and waste. One of the species contributing to bioethanol is the Kallar Grass (*Leptochloa fusca* L. Kunth) which is a salt-tolerant grass. Soil salinity can be easily eradicated by cultivation of this grass in salt-affected areas. Bioconversion of Kallar grass to ethanol is a good approach in utilization of this grass as a biofuel feedstock to meet the global energy demand. Kenaf (*Hibiscus cannabinus* L.) is a tropical annual fiber crop possessing high-quality cellulose. Considerable efforts have been made in recent years to study the adaptability of kenaf varieties in European environments to produce biomass under various climatic conditions and proper planting time. *Leucaena leucocephala* is found in many parts of tropics and its wood can serve as a biofuel for heat and electricity production using different conversion technologies. Lupin is another bioenergy species which has its major centres of diversity in South America and western North America. It can be used a biofuel source as the grain oil content is 8-20 percent. Meadow foxtail (*Alopecurus pratensis* L.) is a plant common on grasslands, especially on



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on neutral soils. It is a suitable crop for the production of biomass for use as a biofuel which involves burning the biomass for the production of heat and electricity. Poplar, a temperate zone species is being used for biomass and biofuel in energy forestry systems. They are more desirable for biofuels than other woody crops because of their ability to produce a significant amount of biomass in a short period of time, and their high cellulose and low lignin contents. Other bioenergy species are Algae, Kudzu, Rosin weed (*Silphium integrifolium*), Miscanthus etc. This paper overviews bioenergy species from different ecologies and agro-forestry systems. Bamboo is a member of the grass family (Poaceae) and has great potential for use as feedstock for biofuel production. Jojoba (*Simmondsia chinensis*) and Jatropha (*Jatropha curcas*) oil suitable as a potential feedstock for biodiesel production. Corn (*Zea mays*) grain makes a good biofuel feedstock due to its starch content and its comparatively easy conversion to ethanol. Sweet sorghum (*Sorghum bicolor*) is a promising target for biofuel production. It is a C4 crop with low input requirements and accumulates high levels of sugars in its stalks. Karanj (*Derris indica*) has a potential to be used as a basic feedstock for the production of biodiesel. Karanja trees can grow on sides of roads, canal and boundary portion of agricultural lands with minimum care. Pearl millet (*Pennisetum glaucum*) represents an interesting alternative to corn for ethanol production because



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of their high biomass yield under a wide range of environmental conditions and high concentration of readily fermentable sugars.

Keywords: biomass, sustainable, renewable, biofuel, bioenergy

Rishi Behl

Prof. Rishi Kumar Behl formerly served as Professor of Plant Breeding and Associate Dean, College of Agriculture, CCS Haryana Agricultural University, Hisar, and is now working as Dean, Faculty of Science, Jagan Nath University, Bahadurgarh, India. He obtained his B.Sc (Agri.) from Rajasthan University, Jaipur, M.Sc (Agri.) and Ph.D from Haryana Agriculture University, Hisar, India, with distinguished academic career. He specializes in Genetics & Plant Breeding by training and Sustainable Agriculture by practice. He has been associated with the development of wheat, triticale, barley, sugar beat genotypes with specifically useful traits for stress tolerance, produce quality and favorable plant microbe interactions. He has 41 years' experience of teaching and research in plant breeding. In recognition of his outstanding contributions in plant sciences, he has been awarded Bharat Ratna C Subhramaniam Award for Outstanding Teacher by Indian Council of Agricultural Research (ICAR), New Delhi. He has been Honorary DAAD Advisor at German Academic Exchange Service DAAD Germany (2006-09).





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He has been editor in chief of Annals of Biology for more than three decades, Associate Editor of Annals of Agri Bio Research, Editorial Board Member of Archives of Agronomy and Soil Science (Germany), International Journal of Crop Breeding and Genetics (EKIN, Turkey), International Advisory Board Member of Tropics (Japan), Associate Editor, Cereal Research Communication (Hungary), Associate Editor, South Pacific Journal of Natural Science (Fiji), Sr. Editor, Journal of Basic Microbiology (Germany), has about 240 publications in international and national journals and 39 edited books and manuals. He has been Founder Secretary, Society for Sustainable Agriculture and Resource Management (SSARM), India; International Council for Sustainable Agriculture (ICSA) and International Foundation for Sustainable Development in Africa and Asia (IFSDAA), Germany. He participated in and organized several international conferences in India and abroad. Currently he is involved in steering research and development activities in the area of application of technology for sustainable development.

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The Farm as First Step for the Circular Economy

Daniele Pagani, Nordic Folkecenter for Renewable Energy, Denmark

The conventional role of farms has always been to provide food to the population. This function, still crucial, has now been joined by another one, also essential for modern societies: energy production. Farmland is the ideal terrain for combining different renewable energy technologies, to allow food and energy production, but at the same time proper waste disposal. The case analyzes the potential of combining wind energy, hydrogen and biogas to produce bio-methane, which can then be used for electricity, heat or transportation; at the same time, the manure and the organic waste can be used to enrich the fields, therefore creating the basis for a circular economy solution.

Daniele Pagani

He holds a B.Eng. in Global Business Engineering and a B.Eng. in Mechanical Engineering from VIA University College, Denmark, His main research interests are related to sustainable mobility and to sustainable mobility and applications of hydrogen in the industrial and agricultural sector. Currently pursuing a MSc. in Engineering - Technology-Based Business Development from Aarhus University, he is also the responsible for education in Folkecenter.





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Standardization of Extracts of Operculina Turpethum (linn.)

Silva manso Roots and Evaluation of its Effects on Inflammation

Akash Ved, Goel Institute of Pharmaceutical Sciences, India

Operculina turpethum (Linn.) *Silva Manso*, belonging to the family *Convolvulaceae*, is an important plant in India conventional system of medicine which is extensively employed by different tribes in many countries to treat inflammatory (edema) and painful conditions like arthritis, back pain; hyperlipidemia, diabetes mellitus, liver disorders, skin disorders and to regulate bowel functions. Objective: In the present study, the roots of *Operculina turpethum* was subjected to physicochemical, phytochemical standardization, the chromatographic separation which was carried out by column chromatography, thin layer chromatography (TLC), and high-performance thin layer chromatography (HPTLC). And further, the acute toxicity, cytotoxic and anti-inflammatory activities of *O. turpethum* roots was investigated against various models. Materials and Methods: This study includes percentage yield of extraction, organoleptic evaluation along with the estimation of its physicochemical investigations such as pH, loss on drying, ash values, extractability in hot water and ethanol, volatile oil content and preliminary phytochemical screening. The isolation of active phytoconstituents was carried out by column chromatography, and the isolated compound was then subjected to TLC and



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HPTLC. Cytotoxic activity was tested by WST-1 based cell viability assay on HepG2 cells. Anti-inflammatory activity of methanol extract (ME) evaluated against inflammation occur by both in vitro and in vivo method. In vitro method was estimated by egg albumin denaturation method and in vivo method was estimated by egg albumin-induced paw edema and cotton pellet-induced granuloma method in Wistar albino rats. Results: The percentage yield of different extracts of dried roots of *O. turpethum* in petroleum ether, benzene, chloroform, and methanol were found to be 2.6% w/w, 4.9% w/w, 2.9% w/w, and 9.4% w/w respectively. The pH of coarse powder of *O. turpethum* in 1% w/v and 10% w/v solutions were found to be 6.83 ± 0.046 and 5.58 ± 0.035 respectively. The loss on drying was found to be $13 \pm 0.20\%$ w/w. The total ash, water-soluble ash, and acid-insoluble ash value were found to be $8.25 \pm 0.05\%$ w/w, $4.12 \pm 0.08\%$ w/w, and $2.23 \pm 0.03\%$ w/w respectively. The hot aqueous soluble and hot ethanol soluble extractable matters were found to be $7.05 \pm 0.03\%$ w/w and $12.07 \pm 0.31\%$ w/w respectively. The volatile oil content was found to be $2.35 \pm 0.13\%$ v/w. The methanolic extract showed the presence of most of the phytoconstituents out of all the extracts. The phytoconstituent phytosterol, i.e., β -sitosterol was isolated by column chromatography, identified and quantified by TLC and HPTLC, which is responsible for the anti-inflammatory activity. The amount of β -sitosterol was found to be $14.09 \mu\text{g}$ in 10.00 mg



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fraction of MEOT. MEOT is devoid of toxicity up to 2000 mg/kg in Wistar albino rats. It was found that in vitro anti-inflammatory activity of MEOT by egg albumin denaturation method shows a remarkable decrease in turbidity by increasing the percentage inhibition of albumin denaturation (60.52%) in MEOT treated group as compared with control group. In egg albumin-induced edema in rats, MEOT at the dose of 400 mg/kg reduced the edema formation (3.03 ± 0.02) induced by egg albumin at 4th h. In cotton pellet-induced granuloma in rats, MEOT at the dose of 400 mg/kg displayed maximum granuloma inhibition (51.06%) which is comparable to that of indomethacin, standard drug. Conclusion: From the present study, the obtained findings confirm that *Operculina turpethum* contains β -sitosterol which is responsible for potent anti-inflammatory without any cytotoxicity of the plant. The results suggested a high potential for application for ME of *O. turpethum* roots as an anti-inflammatory agent. The generated report of the present study will present data which is gainful in the correct identification and authentication of this natural plant and may assist in determining the quality and purity of a crude drug which further helps in preventing its adulteration.

Keywords: *Operculina turpethum*, Convolvulaceae, β -sitosterol, HPTLC, Toxicity, Anti-inflammatory, Egg albumin-induced inflammation.



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Akash Ved

Dr. Akash Ved is working as Director, Goel Institute of Pharmaceutical Sciences, Lucknow, India. He has vast experience in the field of academic development in Pharmacy at several positions. He played key role in drafting the policies and implementations for development of many Pharmacy institutions. He did research and published articles in the field of Pharmaceutical Chemistry that includes: Phytochemistry, Phytopharmacology, Ethnopharmacology, Organic Chemistry, Organometallics, Parallel Synthesis, Microwave-Assisted Organic Synthesis and Medicinal Chemistry. Special interest and exposure to natural products associated with hepatoprotective activity, anti-oxidant, CNS, anti-inflammatory activity and Anti-cancer activity.



Effect of Liquid Bioformulation (Plant Force Advance) on the Growth and Yield of BT Cotton Variety RS 2013 in Field Conditions

Palvindar Singh Chhinzer, Surender Kaur Memorial Agriculture College, India

India's agriculture sector is growing at 2.1 per cent in 2017-18. The economic survey indicated that the government is keen on doubling farmers' income by 2022, for which it has launched several new initiatives that encompass activities from quality seed



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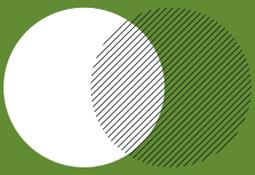
to marketing of outputs. The government initiatives like Soil Health Card, Input Management, Per Drop More Crop under Pradhan Mantra Krishi Sinchai Yojana (PMKSY) boosted the new approaches towards novel bio-based fertilisers in existing farm practices. Due to intensive involvement of labour in different farm operations, the cost of production of many crops is quite high. The increased crop production largely relies on the type of fertilizers used to supplement essential nutrients for plants, which has also led to an increasing dependence on chemical fertilizers. The over exploitation of chemical fertilisers during several last decades has led to environmental problems. So, there is a dire to switch to natural biological based organic inputs as an alternative to agro-chemicals and the search to explore the cheap waste materials as new resources. Human hair is rich source of nitrogen-containing (~16%) organic material predominantly made up of keratin proteins and the foliar application in the form of protein hydrolysate provides organic and readily available nitrogen to the plants. This approach has led to utilization of human hairs to produce a liquid nitrogenous biofertilizer involving their chemical hydrolysis. The liquid formulation "Plant Force Advance" of Floritech Organo Industries, Nagpur was tested for its efficacy in RS2013 variety of Bt-cotton under field conditions in Sri Ganganagar district of Rajasthan. The approved package of practices of cotton for Rajasthan State, Department of Agriculture was followed and the



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agronomic and biological parameters were studied in the cotton crop grown in one acre at Research Farm of Surender Kaur Memorial Agricultural College, Padampur, during Kharif 2017. The test plots were given the foliar spray of liquid formulation (having approx. 8% (v/v) nitrogen and diluted 1:200 with water) 45 days after germination of the seeds followed by three more sprays each after the interval of 15 days. The control plots were given foliar spray of water only. The results showed increase in height of the test plants by 17% as compared to control, enhancement in the chlorophyll content of plant leaves by 14%, increase in weight of balls per plant by 16% as well as 17% reduction in immature ball formation per plant. The total yield showed an increase of 12% with the foliar spray of liquid formulation. Our study concluded that the application of foliar spray of Plant Force Advance along with recommended package of practices improves the productivity of Bt-cotton under the field conditions.

Keywords: PMKSY, Biofertilizers, RS2013. waste human hairs, hydrolysate.



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Agroforestry in Africa for Sustainability and Climate Change Mitigation

Anne Mette Lykke, Aarhus University, Denmark

Restoration of degraded land in Africa by reorienting towards more trees is a simple and cheap way to increase CO₂ sequestration, which, at a large scale, could make an extremely important contribution to controlling global climate change. Besides, agroforestry, using the best native tree species, strengthens resilience, biodiversity and sustainability of degraded land as well as local livelihoods. As part of an EU research project, UNDESERT, we established a small practical agroforestry carbon project, ARLOMOM, in close collaboration with local communities in Senegal. The tree species selection was based on local people's preferences. The selected traditional wild food trees have many advantages being well adapted to the local environment and costumes and by improving food security, health, self-sufficiency and diversification in the local production. Long-term projects like agroforestry, however, are not always easy to establish, but overall there are many good reasons making it worthwhile and highly important to spread agroforestry in Africa.



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Anne Mette Lykke

Senior Researcher in the Bioscience department of Aarhus University in Denmark, with focus on Biological, interdisciplinary and applied research in the tropics, mainly West Africa, on nature conservation, sustainable use of the natural vegetation and carbon sequestration using tree planting and natural regeneration. Coordinator of several EU and Danida projects in these fields. Presently focus on the application of research results in close collaborations with local communities in Africa with the aim to establish agroforestry that provide a variety of local food products and at the same time carbon stocks, that can be traded at the voluntary carbon market.





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Session 6: Smart Farming Technology

Solar-Powered Irrigation System: a Clean and Affordable Solution

Katia Cantot, Nordic Folkecenter for Renewable Energy, Denmark

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EPG-Energy Power Greenhouse

Ditmar Schmidt, SIMV e.V., Germany

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Solar-Powered Irrigation System: a Clean and Affordable Solution

Katia Cantot, Nordic Folkecenter for Renewable Energy, Denmark

Irrigation is one of the main problems for many countries with limited access to water resources. An efficient use of water can allow people to increase the yield of their plants, while, at the same time, reducing water waste. Irrigation systems are the solution for that, but they can be expensive or require access to electricity, which is not always available. The concept presented uses a small pump powered by a battery and a 10 W PV panel, which makes it suitable for any location. The pump is controlled by Arduino, to allow customization of operation. The concept will soon be available open-source on Folkecenter's website, so that people can implement their own irrigation system for little money.

Katia Cantot

Katia is currently enrolled in the graduate school of engineering ECAM, in France. While studying on the general line of the education, she decided to come as a trainee to Nordic Folkecenter, to better discover the renewable energy sector. At Folkecenter, she has been in charge, among other projects, to develop a solar-powered irrigation system.





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EPG-Energy Power Greenhouse

Ditmar Schmidt, SIMV e.V., Germany

The Envelope technology transfer center uses technologies allowing the solar generation of electricity, heat and cold in addition to seasonal storage integrated into the building to ensure self-sufficient air conditioning according to three climatic zones: subtropics, temperate zone and Tundra, throughout the year. A component of the building is its highly transparent envelope, i.e., a membrane structure which consists of fluoropolymer film. It both provides high-quality living space, and ensures optimum protection for the solar energy systems installed within the envelope. The construction of the new envelope building is the first known large-scale application of a long-time storage system integrated into a building to cover the its entire energy demand using solar concentrator technology. The energy systems used by the envelope technology follow the course of the sun, and light separation by fresnell-lenses. Concentrator solar cells and thermal absorbers are located at the focus.

Concentrating photovoltaics: A narrow band of solar cells is cooled, and generates electricity with high efficiency. The cooling fluid is fed to a heat accumulator.

Thermal absorber: Special tubes generate heat at a high temperature which is used as process heat.



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Solar cooling: Solar heat is used for running an absorption cooler. At the same time, winter cold is stored in special tanks underground.

The operating principle is based on the concentration of direct sunlight and its conversion into electrical power, heat and light, thus reducing the heat load within the building's structure. This also leads to a lower demand of water for plant growth, and to less expenditure for cooling. Heat stored in the building is used for air conditioning (heating or cooling) throughout the year. The remaining diffused light ensures sufficient illumination and allows optimum plant growth.

Ditmar Schmidt

Dr.-Ing. Ditmar Schmidt, born 10.10.1948 in Stralsund, Germany, studied from 1967-1973 at the Technical University of Kiev, 20 years of research, teaching at the Technische Hochschule Wismar, University Maputo



Mosambik in power electronics, power stations, transmission lines, electrical grids. From 1994.-98 head of the development department of the company "Solar Nord" Germany. Developer of the first touristic electric car in East Germany. Since 1994 Project planning in the engineering office for renewable energies and



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energy saving creation and management "KIESCH". 1997 Co-founder and president since 2000 of the NGO "Solar Initiative Mecklenburg Vorpommern (SIMV e.V.)". SIMVe.V. has a worldwidenetwork, the activities are project development, information, demonstration, education,training, research on renewable energies and energy saving. 5 international conferencesevery year since 1997 on the topics alternative transport, solar heating andcooling, solar architecture and reconstruction of old buildings, regional development. Co-founder of the 100% renewable energy region Lübow-Krassow, support of the realisation on the projects: first solar pier Germany with alternative traffic plan, Energy-Environmental Centre Balkan (Bulgaria), Bacalareus - study planTU Szczecin, 2003 solar information, demonstration, research and Conference center MV (German Solar Award), 2008 Solar Technology Centre MV (EPG). Author and publisher of various books in the mentioned fields. Since 2005 study visits and lecture tours in Nigeria, Vietnam, Ukraine, Thailand, Denmark, Bulgaria.



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Session 7: Value Added Zero Waste Processing Technology

Changes in Organic Waste During Composting Using Indigenous Earthworm Species

Vineeta Shukla, Maharshi Dayanand University, India

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Let Nature protect us – Identification of Bio-technologies Given by Nature

*Jørgen Løgstrup, TransForm af 1994 ApS / Danish Rootzone and
Baccess A/S, Denmark*

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Changes in Organic Waste During Composting Using Indigenous Earthworm Species

Vineeta Shukla, Maharshi Dayanand University, India

The generation of waste materials is increasing proportionately with the growth of human population and increasing pace of industrialisation. Earthworm with their marvellous capability of ingestion, digestion and excretion are nature's most useful converters of wastes. India, as a developing nation, along with rapid industrialization and modernization, switched over to chemical fertilizers and poisonous pesticides. The excessive use of agrochemicals altered the physiochemical features of soil, diminished food quality, destroyed soil biota and promoted resistant varieties of insect and pests. As agriculture and ultimately civilization depend on the maintenance of fertile topsoil, advantages of traditional fertilizers like vermicompost have to be brought into focus, and implementation must be initiated. A laboratory experiment was carried using indigenous earthworm *Metaphire posthuma* and *Lampito mauritii* for converting different solid waste into valuable vermicomposts. The action of worms accelerated the decomposition of selected wastes. Analysis of waste from experimental container after 15 days interval for physical and biochemical activities revealed that worm is capable of recycling of solid waste into useful nutrients. During this process organic matter, pH and C:N



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ratio revealed negative trend, however total nitrogen and phosphorous content expressed positive trend of increment with vermicomposting up to 60 days, clearly indicating the potential of earthworm biotechnology in conversion of waste, in the form of nutrient enrichment i.e. vermicompost. From the present study, it can be concluded that Vermiculture and vermicomposting technology is easy to practice, ecologically safe and economically sound. Changes in the chemical composition of the feeding substrates confirmed the role of earthworm activity in increasing soil fertility. The selected parameters such as pH, electrical conductivity; organic matter, Nitrogen, Phosphorous and C: N ratio met the quality standards. The time consumed by vermitechology to produce vermicompost is 60 days, which is very low the time consumed by conventional methods. The physical and chemical parameters were changed in all final vermicomposts with respect to initial feed substrates. Exposed earthworms were shown to be a sensitive endpoint in toxicity tests of various inorganic and organic compounds under study in laboratory, using metals and pesticides.



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Vineeta Shukla

Vineeta Shukla holds Ph.D. in topic related to Environmental Toxicology and a M.Sc. Zoology degree from Maharshi Dayanand University, Rohtak, India. Her main research interests are related to Toxicology and Animal Physiology



and on how could the different pollutants or human activities pollute the environment and effect living beings ,including human beings. She worked in relation to effects of pesticides, metals individually and in combinations on biochemical, enzymological , behavioural and reproductive aspects in fish, rats and earthworms. Impact of radiations and air pollution is being studied by her on reproductive aspects of rats and human beings. Since November 1991, she works in Department of Zoology in Maharshi Dayanand University, Rohtak, India, where she is doing research, Teaching PG classes and working for science popularization.



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Let Nature protect us – Identification of Bio-technologies Given by Nature

Jørgen Løgstrup, TransForm af 1994 ApS / Danish Rootzone and Baccess A/S, Denmark

Plants are not only used for decoration or food production: a function many people is not fully aware of is their capacity to clean waste waters: from purifying waste waters of a car-wash system, to taking care of the sewage of cities, everything can be done by a combination of plants, bacterias and algae.

Additionally, these systems can provide relief to desert areas, by increasing the air humidity and by lowering the ground temperature.

The presentation illustrates some of these applications, together with the context in which they have been applied, and it shows the potential that these solutions have in developing countries, but also in the developed ones.

Jørgen Løgstrup

Jørgen Løgstrup holds a M.Sc. in Agricultural Economics from the Royal Veterinary & Agricultural University in Copenhagen, Denmark. He has 35 years of experience in consulting services regarding environmental issues.



Specialized in development of new biological technologies for



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treatment of sludge and wastewater, he has introduced and initiated biological wastewater and sludge treatment, in many countries worldwide. He is author of "Biological methods for treatment and re-cycling of sludge products", a report developed for The Danish Ministry of Industry. Jørgen has been part of various investigation programmes concerning wastewater and sludge treatment and he is a consultant and project manager for the Danish Government in the field of Urban Ecology. Additionally, he has given lectures in a number of universities and institutes in Denmark and abroad.

Throughout his career, Jørgen has worked in the following countries: China, Czech Republic, Slovakia, Colombia, Argentina, Brazil, Venezuela, Jordan, Saudi Arabia, Sultanate of Oman, UEA, Israel, Kenya, Uganda, Botswana, Namibia, South Africa, India, Malaysia, Australia, USA, Poland, Switzerland, France, UK, Holland, Sweden, Norway, Germany and Denmark.



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